

1. An olefin polymerization catalyst comprising:

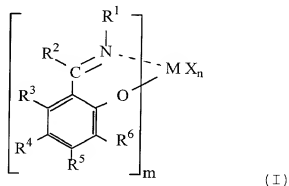
(A) a transition metal compound represented by the following formula (I), and

(B) at least one compound selected from:

(B-1) an organometallic compound,

(B-2) an organoaluminum oxy-compound, and

(B-3) a compound which reacts with the transition metal compound (A) to form an ion pair:



wherein M is a transition metal atom selected from Groups 3-7 and 11 of the periodic table,

m is 1,

R<sup>1</sup> to R<sup>6</sup> may be the same or different, and are each a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing

group or a tin-containing group, and two or more of them may be bonded to each other to form a ring,

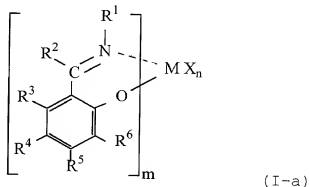
when  $m$  is 2 or greater, two of the groups  $R^1$  to  $R^6$  may be bonded to each other, with the proviso that the groups  $R^1$  are not bonded to each other,

$n$  is a number satisfying a valence of  $M$ , and

$X$  is a hydrogen atom, a halogen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group or a tin-containing group, and when  $n$  is 2 or greater, plural groups  $X$  may be the same or different and may be bonded to each other to form a ring.

2. The olefin polymerization catalyst as claimed in claim 1, wherein  $R^6$  in the formula (I) is a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing group or a tin-containing group.

3. The olefin polymerization catalyst as claimed in claim 1, wherein the transition metal compound represented by the formula (I) is a transition metal compound represented by the following formula (I-a):



wherein M is a transition metal atom selected from Groups 3-7 and 11 of the periodic table,

m is 1,

R<sup>1</sup> to R<sup>6</sup> may be the same or different, and are each a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, a hydrocarbon-substituted silyl group, a hydrocarbon-substituted siloxy group, an alkoxy group, an alkylthio group, an aryloxy group, an arylthio group, an acyl group, an ester group, a thioester group, an amido group, an imido group, an amino group, an imino group, a sulfonester group, a sulfonamido group, a cyano group, a nitro group, a carboxyl group, a sulfo group, a mercapto group or a hydroxyl group, and

two or more of them may be bonded to each other to form a ring,

when  $m$  is 2 or greater, two of the groups  $R^1$  to  $R^6$  may be bonded to each other, with the proviso that the groups  $R^1$  are not bonded to each other,

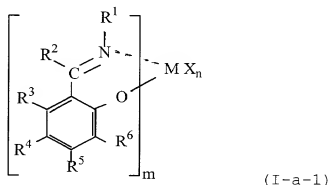
$n$  is a number satisfying a valence of  $M$ , and

$X$  is a hydrogen atom, a halogen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group or a tin-containing group, and when  $n$  is 2 or greater, plural groups  $X$  may be the same or different and may be bonded to each other to form a ring.

4. The olefin polymerization catalyst as claimed in claim 3, wherein  $R^6$  in the formula (I-a) is a halogen atom, a hydrocarbon group, a heterocyclic compound residue, a hydrocarbon-substituted silyl group, a hydrocarbon-substituted siloxy group, an alkoxy group, an alkylthio group, an aryloxy group, an arylthio group, an acyl group, an ester group, a thioester group, an amido group, an imido group, an amino group, an imino group, a

sulfonester group, a sulfonamido group, a cyano group, a nitro group, a carboxyl group, a sulfo group, a mercapto group or a hydroxyl group.

5. The olefin polymerization catalyst as claimed in claim 1, wherein the transition metal compound represented by the formula (I) is a transition metal compound represented by the following formula (I-a-1):



wherein M is a transition metal atom selected from Groups 3-7 and 11 of the periodic table,

m is 1,

R<sup>1</sup> to R<sup>6</sup> may be the same or different, and are each a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, a hydrocarbon-substituted silyl group, a hydrocarbon-substituted siloxy group, an alkoxy group, an alkylthio group, an aryloxy group, an arylthio group, an acyl group, an ester group, a thioester group, an amido group, an imido group, an amino

group, an imino group, a sulfonester group, a sulfonamido group, a cyano group, a nitro group or a hydroxyl group, and two or more of them may be bonded to each other to form a ring,

when m is 2 or greater, two of the groups  $R^1$  to  $R^6$  may be bonded to each other, with the proviso that the groups  $R^1$  are not bonded to each other,

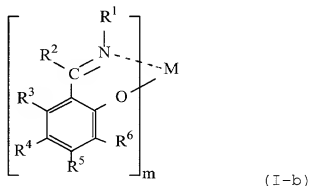
n is a member satisfying a valence of M, and

X is a hydrogen atom, a halogen atom, a hydrocarbon group of 1 to 20 carbon atoms, a halogenated hydrocarbon group of 1 to 20 carbon atoms, an oxygen-containing group, a sulfur-containing group or a silicon-containing group, and when n is 2 or greater, plural groups X may be the same or different and may be bonded to each other to form a ring.

6. The olefin polymerization catalyst as claimed in claim 5, wherein  $R^6$  in the formula (I-a-1) is a halogen atom, a hydrocarbon group, a heterocyclic compound residue, a hydrocarbon-substituted silyl group, a hydrocarbon-substituted siloxy group, an alkoxy group, an alkylthio group, an aryloxy group, an arylthio group, an acyl group, an ester group, a thioester group, an amido group, an imido group, an amino group, an imino

group, a sulfonester group, a sulfonamido group, a cyano group, a nitro group or a hydroxyl group.

7. The olefin polymerization catalyst as claimed in claim 1, wherein the transition metal compound represented by the formula (I) is a transition metal compound represented by the following formula (I-b):



wherein M is a transition metal atom selected from Groups 3-7 and 11 of the periodic table,

m is 1,

R<sup>1</sup> to R<sup>6</sup> may be the same or different, and are each a hydrogen atom, a halogen atom, a hydrocarbon group, a hydrocarbon-substituted silyl group, an alkoxy group, an aryloxy group, an ester group, an amido group, an amino group, a sulfonamido group, a cyano group or a nitro group, and two or more of them may be bonded to each other to form a ring, and

when m is 2 or greater, two of the groups  $R^1$  to  $R^6$  may be bonded to each other, with the proviso that the groups  $R^1$  are not bonded to each other.

8. The olefin polymerization catalyst as claimed in claim 5, wherein  $R^6$  in the formula (I-b) is a halogen atom, a hydrocarbon group, a hydrocarbon-substituted silyl group, an alkoxy group, an aryloxy group, an ester group, an amido group, an amino group, a sulfonamido group, a cyano group or a nitro group.

9. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 3 of the periodic table.

10. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 4 of the periodic table.

11. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 5 of the periodic table.



12. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 6 of the periodic table.

13. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 7 of the periodic table.

14. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 11 of the periodic table.

15. A method for polymerizing olefin using the olefin polymerization catalyst as claimed in any one of claims 1 to 14.